THE REMARKABLE EVOLUTION OF THE POST-AGB STAR FG SGE

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FG Sagittae is one of the most important key objects of post-AGB stellar evolutionary studies. As a consequence of a final helium shell flash, this unique variable has shown real evolutionary changes on human time scales during this century. The observational history was reviewed in comparison with predictions from evolutionary models.

The central star of the old planetary nebula (He1-5) evolved from left to right in the HR diagram, going in just hundred years from the hot region of exciting sources of planetary nebulae to the cool red supergiant domain just before our eyes becoming a newly-born post-AGB star. The effective temperature of the star was around 50,000 K at the beginning of this century, and the last estimates in the late 1980s give 5,000-6,500 K. Recent spectroscopic observations obtained by Ingemar Lundström show definite changes in the nebular line intensities. This fact undoubtedly rules out the possibility that, instead of FG Sge, a hidden hot object would be the true central star of the nebula. Consequently, the observed evolutionary changes are connected with the evolution of a single star.

Due to mixing processes accompanying the rapid evolution, the surface chemical composition of FG Sge also showed drastic changes. In the early 1970s, an enhancement in the abundances of s-process elements was observed, then in the 1980s FG Sge became a carbon star. In 1992 a 4 mag dimming of the object was observed which was later identified as an R CrB type decline. Since then, FG Sge has been one of the most active members of this class of variables. Though FG Sge is not so hydrogen deficient as a typical R CrB star, both its photometric and spectroscopic behaviour support the R CrB classification. Witnessing the birth of a new R CrB star reveals the evolutionary state of these variables as born-again AGB objects.

During the redward evolution FG Sge became unstable against radial pulsation, thus the pulsational properties also provide useful information on the changes in the surface physical parameters. Investigating the changes in the pulsational behaviour coincidental with the occurrence of the decline episodes also help to understand the R CrB phenomenon. The direct observational evidence of chemical evolutionary processes (nucleosynthesis, mixing, dust condensation) and of different type mass loss episodes (planetary nebula, mass ejection connected with the final flash and with the R CrB behaviour) also give the opportunity to study such phenomena which are closely related with stellar evolution.

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